CLAIMS

1. A method for controlling an electric field in carrying out an electrophoretic process on a microfluidic device, said electric field capable of electrokinetically moving sample along a channel, said method comprising:

applying an electric field to at least a first channel causing a sample to move towards a first location along the first channel;

monitoring by optical detection the first location for at least a portion of said sample; and

automatically modifying the electric field upon detecting the portion of the sample at the first location.

2. The method of claim 1 wherein said monitoring is performed by monitoring at least one of fluorescence, absorbance, and light scatter from said sample.

3. The method of claim 2 wherein said optical detection is performed by monitoring fluorescence of the sample induced by a laser.

4. The method of claim 2 wherein the optical detection is performed with an imaging device.

5. The method of claim 1 further comprising monitoring a plurality of locations.

6. The method of claim 5 wherein a single optical detector monitors each and every location.

7. The method of claim 6 wherein the single optical detector is movable.

8. The method of claim 5 wherein a plurality of optical detectors separately monitor the plurality of locations.

9. The method of claim 1 wherein the electrophoretic process is an ITP process and the sample is electrophoretically stacked prior to reaching the first location.

10. The method of claim 9 wherein automatically modifying the electric field comprises switching application of a voltage potential from a first set of reservoirs to a second set of reservoirs, said first and second sets of reservoirs being in fluid communication with said first channel.

11. The method of claim 10 wherein said ITP process is automatically followed by a zone separation.

12. The method of claim 1 wherein said automatically modifying the electric field results in injecting a predetermined quantity of sample into a second channel.

13. The method of claim 2 wherin said optical detection is performed with a single point detection device.

14. A method for performing an electrophoretic process on a microfluidic device comprising a first, second, third, fourth and fifth reservoir and a first channel extending from the first reservoir to the fifth reservoir, said device further comprising a second channel, third channel, and fourth channel and said second channel, third channel and fourth channel being in fluid communication with said first channel at respectively second-channel, third-channel, and fourth-channel intersections and each of said intersections being spaced along said first channel such that, relative to said first reservoir, said second-channel intersection is proximal to the third-channel intersection and the third-channel intersection is proximal to the fourth-channel intersection and the fourth-channel intersection is proximal to the fifth reservoir, and each of said second, third and fourth channels being in fluid communication with the second, third and fourth reservoirs respectively such that materials may be added and removed to the channels via the reservoirs, said method comprising:

applying a first voltage difference between the second reservoir and the third reservoir to move a sample from the second reservoir, into a sample region along the first channel and between the second-channel intersection and the third-channel intersection;

applying a second voltage difference between the first reservoir and the second reservoir to drive a terminating electrolyte from the first reservoir towards the sample in said sample region;

applying a third voltage difference between the first reservoir and the fifth reservoir to stack components of the sample between the terminating electrolyte and a leading electrolyte;

automatically applying a fourth voltage difference between the fourth reservoir and the fifth reservoir when the last component of the stacked sample reaches the fourth-channel intersection such that the components of the sample spatially separate while migrating along the first channel towards the fifth reservoir.

15. The method of claim 14 wherein an electrode is positioned in each of the reservoirs.

16. The method of claim 15 wherein at least one electrode is floated.

17. The method of claim 15 wherein all electrodes are simultaneously activated.

18. A controller configured to apply voltage differentials as recited in claim 14.

19. A system comprising said controller of said 18 and a detector adapted to sense when said sample reaches a location on the device.

20. The system of claim 19 wherein said location is said fourth-channel intersection.

21. The system of claim 19 wherein said detector is an optical detector.

22. A method for separating a plurality of components of a sample in a microfluidic device having a stacking channel and a separation channel downstream of said stacking channel, said method comprising:

applying a first electric field to concentrate the components between a trailing electrolyte and a leading electrolyte along the stacking channel; and

automatically applying a second electric field when at least a portion of said sample enters said separation channel whereby the components are separated by electrophoretic mobilities along the separation channel.

23. The method of claim 22 wherein the stacking channel and the separation channel are portions of a main channel.

24. The method of claim 23 wherein said electric fields are applied by positioning and activating electrodes in reservoirs that are in fluid communication with said main channel.

25. The method of claim 24 wherein the electrodes are removable.

26. The method of claim 22 wherein an optical detector is positioned to monitor the separation channel for the sample and the first electric field is modified when the detector senses the sample.

27. The method of claim 26 said optical detector comprises a single point detector.

28. The method of claim 26 wherein said optical detector comprises an imaging detector.

29. The method of claim 28 wherein the imaging detector is a charge coupled device camera.